REMARKS

In view of the above amendments and the following remarks, reconsideration of the rejections contained in the Office Action of May 17, 2001, is respectfully requested.

In order to make necessary editorial corrections, the entire specification and abstract have been reviewed and revised. As the revisions are quite extensive, the amendments to the specification and abstract have been incorporated into the attached substitute specification and abstract. For the Examiner's convenience, a copy of the marked-up original specification and abstract is also enclosed, and the marked-up pages are captioned "**Version with markings to show changes made**". The substitute specification and abstract includes the same changes as are indicated in the marked-up copy of the original specification. No new matter has been added by the revisions. Entry of the substitute specification is thus respectfully requested.

The Examiner has objected to Figures 17-20 because these figures require a legend such as "prior art." In view of this objection, a letter re proposed drawing amendments has been submitted herewith in order to propose amendments to these figures in accordance with the Examiner's remarks. In addition, formal drawings including these suggested changes have also been submitted to expedite the prosecution of this application. In view of the letter re proposed drawing amendments and the formal drawings submitted herewith, it is respectfully submitted that the Examiner's objection to the drawings has been overcome.

The Examiner has indicated that claims 44-48 appear to be a substantial duplicate of claims 13-15, 33 and 43, and has therefore provisionally objected to claims 44-48 as being a double patenting of claims 13-15, 33 and 43. The Examiner, however, is requested to note that original claims 1-48 have been cancelled and replaced with new claims 49-94. Although this new set of claims does include claims corresponding to original claims 13-15, 33 and 43, it does not include any claims corresponding to original claims 44-48. As a result, it is respectfully submitted that the provisional double patenting objection has been overcome.

The Examiner has rejected claims 1-3, 5-6, 16-19, 21-22, 24-25 and 34-35 under 35 USC §103(a) as being unpatentable over the Applicants' admitted prior art (APA) in view of the Takahashi reference (EP 0642210), has rejected claims 4, 20, 23, 26, and 36 as being unpatentable over the

APA in view of the Maruyama reference (USP 6,194,800), has rejected claims 7-8, 10, 27-28, 30, 37-38, and 40 as being unpatentable over the APA in view of the Asai reference (JP 406245418), has rejected claims 9, 11-12, 29, 31-32, 39, and 41-42 as being unpatentable over the APA in view of the Asai reference and further in view of the Tanimoto reference (JP 405304737), and has rejected claims 13-15, 33 and 43-48 as being unpatentable over the APA in view of the Asano reference (USP 6,218,753). However, as indicated above, original claims 1-48 have been cancelled and replaced with new claims 49-94. For the reasons discussed below, it is respectfully submitted that new claims 49-94 are clearly patentable over the prior art of record.

As discussed in the specification, conventional motors such as those with distributed windings require a complicated winding process during manufacture, and also require rare earth magnets and sensors which greatly increase the cost of these motors. In view of these problems, the present invention is directed to permanent magnet synchronous motors that comprise stators having teeth and *concentrated windings such that the adjacent teeth have different polarities.*

However, it has been found that in these types of motors, there is an increased risk that the rotors will become demagnetized due to the different polarities of the adjacent teeth in the stator. In view of this concern, the present invention is directed to permanent magnet synchronous motors with several different arrangements for significantly reducing or eliminating the problem of demagnetizing the rotor.

Specifically, as recited in independent claim 49, the rotor and the stator are arranged so that the clearance between the adjacent teeth of the stator is greater than 0.3 of an air gap between the rotor and the stator, and less than or equal to two times the air gap between the stator and the rotor. Independent claim 55, on the other hand, recites a motor in which the rotor and the stator are arranged so that the depth of a side edge of each tooth is greater than two times the air gap between the rotor and the stator, and the depth is less than five times the air gap between the rotor and the stator. Independent claim 61 is directed to a motor in which the rotor and the stator are arranged in accordance with the stator-rotor relationships recited in both independent claims 49 and 55. Independent claim 67 is directed to a motor in which either the leading-side edge or the trailing-side edge of each of the teeth has a bevel formed at the first end closest to the rotor and has a protrusion

formed at the second end farthest from the rotor so that each side edge of the tooth is maintained at a substantially constant depth. Independent claim 72 is directed to a motor in which a permanent magnet is arranged along the rotor rim and an inwardly-tapered section is formed at each side of the outer wall of the permanent magnet so as to form a recessed section at each side of the permanent magnet. Finally, independent claim 90 is directed to a motor in which a rotor includes a curved permanent magnet which is buried in the rotor core along the core rim so that the center of curvature of the permanent magnet is outside the rotor and so that a side end of the permanent magnet faces the rotor rim from inside the rotor rim, and the rotor further includes a spacer that is formed in the rotor at the side end of the permanent magnet. As clearly described and explained in the specification, all of the above arrangements serve to significantly decrease the possibility of demagnetizing the rotor *without* significantly reducing the power output of the motor.

As an initial matter, the Examiner is requested to note that the Maruyama reference (which was used to reject original independent claim 4, which corresponds to new independent claim 67) was filed on April 28, 1999, while the Asano reference (which was used to reject independent claim 13, which corresponds to new independent claim 90) was filed on July 26, 1999. However, the Examiner is also requested to note that the present application is a continuation-in-part application of an international application filed on September 7, 1998, prior to the filing dates of both the Maruyama reference and the Asano reference. Furthermore, it is submitted that the subject matter of original independent claims 4 and 13 and, therefore, 67 and 90, respectively, is fully supported by the disclosure in the international application. In this regard, the Examiner's attention is directed to the Appendix submitted herewith, including an English translation of the international application which clearly indicates the support for each of these claims. As a result, the Examiner is respectfully requested to withdraw the Maruyama reference and the Asano reference as prior art references against the claims of the present application.

The Takahashi reference discloses an ultra-high speed brushless DC motor with *distributed* windings as shown in Figure 1. Thus, this reference does not disclose a stator having teeth in which adjacent teeth have different polarities as recited in each of the independent claims. Consequently, it is submitted that this reference would provide no motivation to one of ordinary skill in the art to

modify the Applicants' admitted prior art in order to obtain the present invention. Specifically, because the Takahashi reference is directed to motors having distributed windings rather than concentrated windings as recited in each of the claims of the present invention, the Takahashi motor does not encounter the problems regarding the demagnetizing magnetic field generated by motors having concentrated windings. Therefore, it is respectfully submitted that one of ordinary skill in the art would not look to the Takahashi reference to address the problems encountered in motors having concentrated windings.

In addition to the above, dependent claims 54, 60 and 66 all recite that the air gap between the rotor and the stator is no greater than 0.6 millimeters. However, the Takahashi reference specifies that this air gap is 2.01 millimeters as described in column 13, line 28. Consequently, it is respectfully submitted that dependent claims 54, 60 and 66 recite a further distinction between the present invention and the Takahashi reference.

Similar to the Takahashi reference, the motor disclosed in the Asai reference employs distributed windings as shown in the drawings. Therefore, adjacent teeth will not have different polarities. As a result, the motor disclosed in the Asai reference will not encounter the demagnetizing problems encountered by motors having concentrated windings such as that of the present invention. Thus, it is submitted that one of ordinary skill in the art would also not look to the Asai reference in order to modify the Applicants' admitted prior art so as to obtain the invention recited in the present claims.

The Examiner asserts that the Tanimoto reference discloses a permanent magnet buried in a rotor core. However, it is respectfully submitted that the Tanimoto reference does not disclose or suggest a motor comprising a rotor and a stator having teeth and concentrated windings such that the adjacent teeth having different polarities, and in which a permanent magnet is arranged as recited in independent claim 72, which corresponds to original independent claim 7.

In view of the above, it is respectfully submitted that the Takahashi reference, the Asai reference, and the Tanimoto reference would not, either alone or in combination, provide the motivation to one of ordinary skill in the art to modify the Applicants' admitted prior art in order to

obtain the invention recited in claims 49-94. Accordingly, it is respectfully submitted that new claims 49-94 are clearly patentable over the prior art of record.

In view of the above amendments and remarks, it is submitted that the present application is now in condition for allowance, and the Examiner is requested to pass the case to issue. If the Examiner should have any comments or suggestions to help speed the prosecution of this application, the Examiner is requested to contact the Applicants' undersigned representative.

Respectfully submitted,

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